9 $a = 1+3\sqrt{t}$ $\frac{mph}{sec}$

a) $\int_0^9 1+3\sqrt{t}\,dt + v_0$

b) $v = \int 1+3\sqrt{t}\,dt = t + 3\frac{t^{3/2}}{3/2} + C$

initial conditions $t=0$ $v=0$ $c=0$

$v = t + \cancel{3}\cdot\frac{2}{\cancel{3}}t^{3/2}$ $\int_0^9 t+2t^{3/2}\,dt =$

234.9 mph · sec

$234.9\ \frac{mi}{\cancel{hr}} \cdot \cancel{sec}\ \frac{\cancel{hr}}{3600\,\cancel{sec}}$

.065 mi

$.065\ \frac{\cancel{mi} \cdot 5280\,ft}{\cancel{mi}}$

344.5 ft

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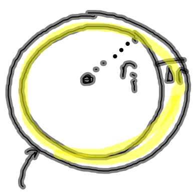
23. density $= 10{,}000(2-r)$

if $r=1$, $d = 10{,}000\ \frac{people}{mi^2}$

a) $r=2$

b)



$\Delta A = 2\pi r\,\Delta r$

c $\Delta P \approx \underbrace{10{,}000(2-r)}_{people/mi^2} \cdot \underbrace{2\pi r\,\Delta r}_{mi^2}$

approx ~~total pop~~ $\approx$ exact $= \lim_{\substack{n\to\infty \\ \Delta r\to 0}} \sum_{i=1}^{n} 10{,}000(2-r_i)\,2\pi r\,\Delta r$

$= \int_0^2 10{,}000(2-r)2\pi r\,dr$

$= 83{,}775.8$ people

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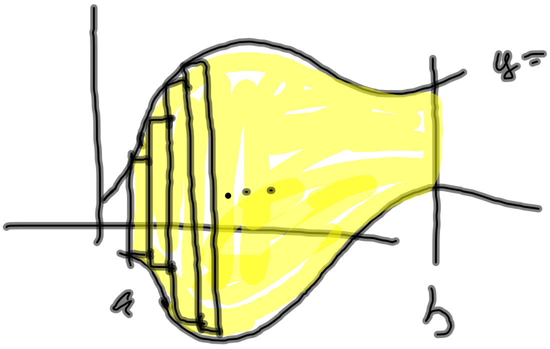
7.2 area between 2 curves



$y = f(x)$

$y = g(x)$

$$A \approx \sum_{i=1}^{n} \left[f(x_i) - g(x_i) \right] \Delta x$$

$$A = \lim_{\substack{n \to \infty \\ \Delta x \to 0}} \sum_{i=1}^{n} \left[f(x_i) - g(x_i) \right] \Delta x$$

$$A = \int_a^b f(x) - g(x)\, dx$$

$$= \left[F(b) - G(b)\right] - \left[F(a) - G(a)\right]$$

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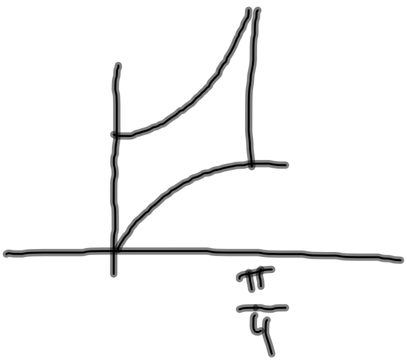
$y = \sec^2 x$

$y = \sin x$

$\left[0, \frac{\pi}{4}\right]$



$$\int_0^{\frac{\pi}{4}} \sec^2 x - \sin x \, dx$$

$$\tan x + \cos x \Big|_0^{\frac{\pi}{4}}$$

$$\left(\tan\frac{\pi}{4} + \cos\frac{\pi}{4}\right) - \left(\tan 0 + \cos 0\right)$$

$$1 + \frac{\sqrt{2}}{2} - 0 - 1$$

$$\frac{\sqrt{2}}{2}$$

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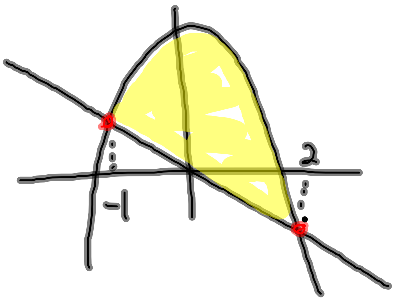
Find the area bound by $y = 2 - x^2$ & $y = -x$



$$2 - x^2 = -x$$

$$0 = x^2 - x - 2$$

$$0 = (x-2)(x+1)$$

$$\int_{-1}^{2} 2 - x^2 - -x \, dx$$

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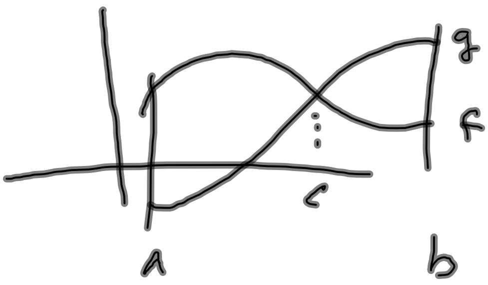

$$\int_a^c f - g \, dx + \int_c^b g - f \, dx$$

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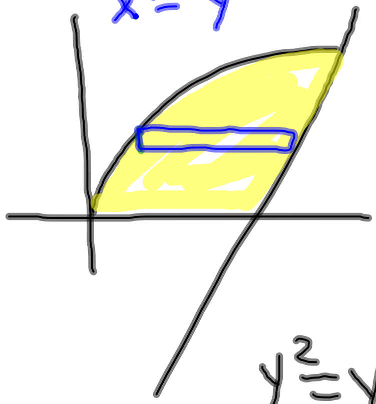
Ex 4 $y=\sqrt{x}$, $y=x-2$, x-axis

$x=y^2$ $x=y+2$



$$\int_0^2 y+2-y^2 \, dy$$

$y^2=y+2$

$y=2$

Jan 12-10:08 AM